IN THE UNITED STATES PATENT & TRADEMARK OFFICE

Application No.:	10/707,229
Filing Date:	November 28, 2003
Inventor (first named):	Scott Sherman
Group Art Unit:	1745
Examiner Name:	Ben Lewis
Attorney Docket No.:	53797.16 (formerly 45283.109)

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DATED: June 30, 2009

SUBSTITUTE APPEAL BRIEF UNDER 37 C.F.R. 41.37
IN RESPONSE TO NOTICE OF NON-COMPLIANT APPEAL BRIEF
DATED JUNE 3, 2009

To: Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Applicant is providing a substitute Appeal Brief under 37 C.F.R. 41.37(c)(1).

The Applicant has corrected the Appeal Brief to be consistent with the final office action.

APPEAL BRIEF UNDER 37 C.F.R. 41.37(C)(1)

Applicant provides Appeal Brief under 37 C.F.R. 41.37(c)(1). The Appeal Brief is filed within the time allowed for Appeal Brief of two months after filing the Notice of Appeal under 37 C.F.R. 41.37(a)(1). The fee for this Appeal Brief is $510.00 under 35 U.S.C. 41(a)(6)(B). Fee payment by Credit Card form is transmitted herewith.

(i) Real Party in Interest

The real parties in interest are the applicants Scott Sherman, Glenn Price, Mehrzad Tabatabaian, Brett Wightman, Athal Christie and Martin Perry.

(ii) Related Appeals and Interferences

There are no prior or other pending appeals, judicial proceedings or interferences known to the Appellant which may be related to, directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.

(iii) Status of Claims

Claims 1-15 are rejected and are under appeal.

(iv) Status of Amendments

No amendments have been filed subsequent to the final rejection mailed May 17, 2007.

(v) Summary of Claimed Subject Matter

The present invention is directed to a novel solid oxide fuel cell stack having solid unitary interconnects with seal defined flow fields for directing reactants to the fuel cell electrodes. The

present invention seeks to overcome the problem of the necessity to manufacture intricate interconnect elements and does so by utilizing seal defined flow fields for the reactants, which flow fields contain the relevant intake and exhaust manifold in combination with a simple unitary interconnect.

According to Figures 2, 3A, and 3B, independent claim 1 is directed to a fuel cell apparatus comprising a vertically repeating series of fuel cell units each comprised of an interconnect (12) having an anode-facing surface and a cathode-facing surface and defining a fuel intake manifold (14), a fuel exhaust manifold (16), an air intake manifold (18) and an air exhaust manifold (20). There is a planar fuel cell (22) having a cathode and an anode surface. Optionally, there is a fuel cell holder plate (24). The fuel cell (22) or fuel cell holder plate (24) as the case may be, defines a fuel intake manifold (14), a fuel exhaust manifold (16), an air intake manifold (18) and an air exhaust manifold (20), each of which align vertically with a corresponding manifold in the interconnect (12).

A cathode gasket seal (30) is disposed between the fuel cell (22) or fuel cell holder plate (24) and the cathode-facing surface of the interconnect (12) and defines a cathode flow field. The air intake manifold (18) and the air exhaust manifold (20) are within the cathode flow field.

An anode gasket seal is disposed between the fuel cell (22) or fuel cell holder plate (24) and the anode-facing surface of the interconnect (12) and defines an anode flow field. The fuel intake manifold (14) and fuel exhaust manifold (16) are within the anode flow field.

There are first (34) and second fuel manifold seals (36) disposed between the fuel cell holder plate (24) and an interconnect (12) for isolating each of the fuel intake (14) and exhaust manifolds (16) respectively. There are also first (38) and second (40) air manifold seals disposed between the fuel cell holder plate and an interconnect for isolating each of the air intake (18) and exhaust (20) manifolds respectively.

Support for independent claim 1 can found in Figures 2, 3A and 3B and in paragraphs [0031]-[0033].

According to Figures 4A, and 4B independent claim 12 is directed to a fuel cell stack comprising alternating layers of interconnects (12), seals (30 and 32), fuel cells (22) and defining a horizontal anode flow field in fluid communication with a vertical fuel intake manifold (14) and a vertical fuel exhaust manifold (16), and further defining a horizontal cathode flow field in fluid communication with a vertical air intake manifold (18) and a vertical air exhaust manifold (20), wherein each of the anode flow field and the cathode flow field is horizontally contained by a compressible seal (30 and 32) and wherein the air intake manifold (18) and the air exhaust manifold (20) are within the cathode flow field and wherein the fuel intake manifold (14) and fuel exhaust manifold (16) are within the anode flow field.

Support for independent claim 12 can found in Figures 4A and 4B and in paragraphs [0034]-[0037].

A listing of claims 1-15 is set forth in the Claims Appendix below.

(vi) Grounds of Rejection to be Reviewed on Appeal

1. Whether claims 1-5 are properly rejected under 35 U.S.C. 102(b) as being anticipated by Donelson (US 6,429,053).

2. Whether claims 1-5 are properly rejected under 35 U.S.C. 102(e) as being anticipated by Ghosh (US 6,855,451).

3. Whether claims 12-13 are properly rejected under 35 U.S.C. 102(b) as being anticipated by Donelson (US 6,429,053).

4. Whether claim 6 is properly rejected under 35 U.S.C. 103(a) as being obvious in light of Donelson (US 6,429,053) having regard to Allen (US 6,777,126).

5. Whether claims 7-8 are properly rejected under 35 U.S.C. 103(a) as being obvious in light of Donelson (US 6,429,053) having regard to Iwase (US 6,245,453).

6. Whether claim 14 is properly rejected under 35 U.S.C. 103(a) as being obvious in light of Donelson (US 6,429,053) having regard to Iwase (US 6,245,453).

7. Whether claim 9 is properly rejected under 35 U.S.C. 103(a) as being obvious in light of Donelson (US 6,429,053) having regard to Bourgeois (US Pub No. 2004/0043278).

8. Whether claim 15 are properly rejected under 35 U.S.C. 103(a) as being obvious in light of Donelson (US 6,429,053) having regard to Bourgeois (US Pub No. 2004/0043278).

9. Whether claims 10 and 11 are properly rejected under 35 U.S.C. 103(a) as being obvious in light of Donelson (US 6,429,053) having regard to Ghosh (US 6,902,798).

(vii) Argument

1. Whether claims 1-5 and 12-13 are properly rejected under 35 U.S.C. 102(b) as being anticipated by Donelson (US 6,429,053).

Examiner has rejected claims 1-5 and 12-13 under 35 U.S.C. 102(b) as being anticipated by Donelson (US 6,942,053).

The specification of the present application identifies the necessity of having to machine complex interconnect elements having such grooves and channels as a prior art limitation. In particular, the specification identifies the problems associated with having to manufacture intricate interconnect elements (see paragraphs [0004] to [0006]). The present invention seeks to overcome the limitations of the prior art by having a simple unitary interconnect with intake and outlet manifolds that is utilized in conjunction with seals that define the reactant flow fields. The fuel cell apparatus of independent claims 1 and 12 has seals that encompass reciprocal intake and exhaust manifolds, whilst excluding the other reactant intake and exhaust manifolds. Thus, in the present application a simplified unitary interconnect may be utilized with the compressible seals which define the reactant flow fields and which direct the reactants through those fields from the intake manifold to the exhaust manifold.

Independent claims 1 and 12 of the present invention both clearly recite that the air intake manifold and the air exhaust manifold are within the cathode flow field, and that the fuel intake manifold and fuel exhaust manifold are within the anode flow field. Such configuration means that the seals not only define the cathode and anode flow fields, but they also direct the reactant flow from the respective intake manifold to the respective exhaust manifold. This is described in detail paragraphs [0032] and [0037] of the present invention and is clearly depicted in Figures 3A and 3B. Further, paragraph 9 of the present application reads as follows:

> The present invention relates to a novel solid oxide fuel cell stack configuration which comprises solid, unitary interconnects **and seal-defined flow fields for directing reactants to the fuel cell electrodes**. [emphasis added]

In contrast, Donelson does disclose or teach not teach seal defined flow fields encompassing exhaust and intake manifolds. Rather, in Donelson, the seal (44) has distinct openings for each of the manifolds and for a central flow field. The manifolds are independently and remotely sealed by the seal (44) and reactant flow in and out of the flow field is achieved using machined grooves or recesses in the interconnect itself (see Donelson, Figure 2, elements 58 and Column 8, lines 9 to 21) extending from the relevant manifold to the flow field.

Thus, it is respectfully submitted that Donelson does not disclose fuel intake and exhaust manifolds within an anode flow field, nor does Donelson disclose air intake and exhaust manifolds within a cathode flow field, both of which are recited elements of independent claims 1 and 12. It is therefore submitted that independent claim 1 and dependent claims 2-5, and independent claim 12 and dependent claim 13, are not anticipated by Donelson.

2. **Whether claims 1-5 are properly rejected under 35 U.S.C. 102(e) as being anticipated by Ghosh** (US 6,855,451).

Examiner has rejected claims 1-5 under U.S.C 35 102 (e) as being anticipated by Ghosh (US 6,855,451). Like Donelson, Ghosh teaches the use of independently sealed manifolds. Reactant flow in the apparatus of Ghosh is managed using manifold openings in the structure of the interconnect (see column 4, lines 47-67 and column 5 lines 1-3). Thus, Ghosh requires a middle barrier plate (42) disposed between two outer interconnect elements. The seal configuration of the present invention (as discussed in detail above) eliminates the need for such a complicated interconnect.

Thus, it is respectfully submitted that Ghosh does not disclose fuel intake and exhaust manifolds within an anode flow field, nor does Ghosh disclose air intake and exhaust manifolds within a cathode flow field, both of which are recited elements of independent claim 1. It is therefore submitted that independent claim 1, and dependent claims 2-5 are not anticipated by Ghosh.

3. **Whether claims 6-11 and 14-15 are properly rejected under 35 U.S.C. 103(a) as being obvious in light of Donelson, having regard to Allen (US 6,777,126) Iwase Iwase (US 6,245,453), Bourgeois (US Pub No. 2004/0043278) and Ghosh (US 6,902,798).**

Examiner has rejected:

(a) claim 6 under 35 U.S.C. 103(a) as being obvious in light of Donelson having regard to Allen.

(b) claims 7-8 under 35 U.S.C. 103(a) as being obvious in light of Donelson having regard to Iwase.

(c) claim 14 under 35 U.S.C. 103(a) as being obvious in light of Donelson having regard to Iwase.

(d) claim 9 under 35 U.S.C. 103(a) as being obvious in light of Donelson having regard to Bourgeois.

(e) claim 15 under 35 U.S.C. 103(a) as being obvious in light of Donelson having regard to Bourgeois.

(f) claims 10 and 11 under 35 U.S.C. 103(a) as being obvious in light of Donelson having regard to Ghosh.

In each of the above referenced obviousness rejections, Examiner has cited Donelson in light of an additional piece of prior art. As discussed above, it is respectfully submitted that Donelson does not disclose or teach the use of air intake and exhaust manifolds within a seal defined cathode flow field, nor does Donelson disclose or teach, fuel intake and exhaust manifolds within a seal defined anode flow field, both of which are recited elements of independent claims 1 and 12. Furthermore, none of Ghosh, Allen, Iwase or Bourgeois disclose or teach intake and exhaust manifolds within seal defined flow fields. As discussed above, the use of seals to direct and contain reactant flow permits the use of a simplified unitary interconnect.

Accordingly, it is respectfully submitted that if the cited prior art does not disclose or teach a recited element of independent claims 1 or 12, then underlying independent claims 1 and 12, and dependent claims 6-11 and 14-15 are patentable and non–obvious notwithstanding the prior art cited by the Examiner.

(viii) Claims Appendix

1. (Original) A fuel cell apparatus comprising a vertically repeating series of fuel cell units (10) wherein each unit comprises:

(a) an interconnect having an anode-facing surface and a cathode-facing surface and defining a fuel intake manifold, a fuel exhaust manifold, an air intake manifold and an air exhaust manifold;

(b) a planar fuel cell having a cathode and an anode and, optionally, a fuel cell holder plate, wherein the fuel cell or fuel cell holder plate defines a fuel intake manifold, a fuel exhaust manifold, an air intake manifold and an air exhaust manifold, each of which align vertically with a corresponding manifold in the interconnect;

(c) a cathode gasket seal disposed between the fuel cell or fuel cell holder plate and the cathode-facing surface of the interconnect and defining a cathode flow field wherein the air intake manifold and the air exhaust manifold are within the cathode flow field;

(d) an anode gasket seal disposed between the fuel cell or fuel cell holder plate and the anode-facing surface of the interconnect and defining an anode flow field wherein the fuel intake manifold and fuel exhaust manifold are within the anode flow field;

(e) first and second fuel manifold seals disposed between the fuel cell holder plate and an interconnect for isolating each of the fuel intake and exhaust manifolds respectively; and

(f) first and second air manifold seals disposed between the fuel cell holder plate and an interconnect for isolating each of the air intake and exhaust manifolds respectively.

2. (Original) The apparatus of claim 1 wherein the cathode gasket seal, and first and second fuel manifold seals are formed by a single seal element.

3. (Original) The apparatus of claim 1 wherein the anode gasket seal, and first and second air manifold seals are formed by a single seal element.

4. (Original) The apparatus of claim 1 further comprising a first porous contact material disposed between the cathode and the cathode-facing surface of the interconnect, within the cathode flow field, and a second porous contact material disposed between the anode and the anode-facing surface of the interconnect, within the anode flow field.

5. (Original) The apparatus of claim 1 wherein the cathode surface of the upper interconnect comprises flow directing ribs for distributing air relatively evenly along the fuel cell cathode surface.

6. (Original) The apparatus of claim 5 wherein the flow directing ribs are stamped into the interconnect.

7. (Original) The apparatus of claim 1 wherein the fuel cell unit has a footprint comprising a substantially quadrilateral shape and wherein each of the anode gas chamber and the cathode gas chamber are disposed diagonally across the footprint.

8. (Original) The apparatus of claim 7 wherein the footprint comprises a substantially rectangular shape.

9. (Original) The apparatus of claim 8 wherein the fuel cell is hexagonal wherein first opposing lateral sides of the fuel cell borders first and second lateral edges of the fuel cell holder plate, second opposing lateral sides of the fuel cell border the air intake and exhaust manifolds respectively and third opposing lateral sides border the fuel intake and exhaust manifolds.

10. (Original) The apparatus of claim 1 wherein a leak path gap is provided between the cathode gasket seal and the first and second fuel manifold seals.

11. (Original) The apparatus of claim 1 wherein a leak path gap is provided between the anode gasket seal and the first and second air manifold seals.

12. (Previously Presented) A fuel cell stack comprising alternating layers of interconnects, seals, fuel cells and defining a horizontal anode flow field in fluid communication with a vertical fuel intake manifold and a vertical fuel exhaust manifold, and further defining a horizontal cathode flow field in fluid communication with a vertical air intake manifold and a vertical air exhaust manifold, wherein each of the anode flow field and the cathode flow field is horizontally contained by a compressible seal and wherein the air intake manifold and the air exhaust manifold are within the cathode flow field and wherein the fuel intake manifold and fuel exhaust manifold are within the anode flow field.

13. (Original) The fuel cell stack of claim 12 wherein the fuel cell stack has a footprint comprising a substantially rectangular shape.

14. (Original) The fuel cell stack of claim 13 wherein the anode flow field and the cathode flow field are each disposed diagonally across the stack footprint.

15. (Original) The fuel cell stack of claim 14 wherein each fuel cell comprises a hexagonally shaped anode surface and a hexagonally shaped cathode surface, each exposed to the anode flow field and cathode flow field respectively.

(ix) Evidence Appendix

There has been no evidence submitted under 37 C.F.R. 1.130, 1.131 or 1.132.

Copies of evidence relied upon as grounds of rejection in Final Office Action dated May 17, 2007 are listed below.

1. US 6,429,053 to Donelson
2. US 6,855,451 to Ghosh
3. US 6,777,126 to Allen
4. US 6,245,453 to Iwase
5. US Pub No. 2004/0043278 to Bourgeois
6. US 6,902,798 to Ghosh

(x) Related Proceedings Appendix

None.

Respectfully submitted,

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